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DEPRECIATION AND RATE CONTROL

SUMMARY

Importance of depreciation for valuation, 630. — A well maintained property is yet normally in a state of depreciation, 632. — How to allow for this circumstance depends on the purpose for which accounts are made up, 635. — Mode of reckoning depreciation required by Interstate Commerce Commission, 637. — "Replacement account," "Reserve for accrued Depreciation," 639. — A possible alternative, 644. — The general procedure justified for purposes of regulation, 648. — Criticism possible as regards earlier charges made, 654. — A different principle and a different rule by other regulating bodies, 656. — Wisconsin Commission, 657. — The United States Supreme Court, 660. — Conclusion, 662.

Two questions outrank in practical consequence all other problems of procedure in the valuation of the properties of public service companies for purposes of rate control. First, what is a proper rate of return upon the investment? Second, shall the property taken as evidence of the investment be valued for that purpose as tho it were new, or shall an allowance be made for the fact that it is in various stages of age, wear, and obsolescence? Under American conditions the difference between original cost and replacement cost as a standard of valuation is not apt to be large,[1] except for real estate holdings, and in the aggregate the difference between the results got by the use of these two methods will usually be less important in its bearing upon the determination of reasonable rates than is the margin of uncertainty with respect to either the proper rate of return or the matter of depreciation. Nor do the minor problems suggested by such phrases as "interest during construction," "going value," "donated property," and the like, usually compare in importance, even in the aggregate, with the two that have been named. The present paper deals with the second of these two major issues of valuation.

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[1] The common practice of averaging prices over a period of five or ten years in determining replacement cost contributes to this end.

In a valuation made for the dual purposes of rate regulation and taxation in Wisconsin the present (depreciated) value of the physical properties of twenty-six electric railways was found to be $7,826,000 or 82 per cent of the "cost of reproduction new" of $9,596,000.[1] For individual companies the corresponding proportion was as low as 57 per cent, and was below 79 per cent in as many cases as above it. And these figures include the value assigned to land and grading, from which no deduction for depreciation was made. The depreciated value of the properties of fifty-four steam railroads was estimated as $196,239,000, or 80 per cent of the cost of reproduction new, which was given as $244,129,000. This percentage varied for individual railroads from 61 to 96, the median being 77.[2] Leaving out of account the items of land and grading, on which no depreciation was reckoned, the depreciated value of the remaining assets of the fifty-four railroads was only 73 per cent of the value new.

The Michigan valuation of the properties of steam railroads in 1900 gave a depreciated value that was 81 per cent of the cost of reproduction.[3] In the Minnesota appraisal of 1907 the corresponding percentage was 88.[4] But when the unusually large list of items in the latter valuation against which no depreciation was charged [1] is eliminated from the reckoning, the proportion is reduced to 76 per cent.

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[1] Fifth Biennial Report of the Wisconsin Tax Commission (1910), Appendix D.

[2] Computed from a table in the Fourth Biennial Report of the Wisconsin Tax Commission (1909), p. 128.

[3] Bulletin 21 of the Bureau of the Census (1905), p. 78.

[4] Twenty-fourth Annual Report of the Minnesota Railroad and Warehouse Commission (1908), p. 52.

Examples of this sort might be multiplied, but it is better to turn to the general principles underlying the aggregate amount of depreciation of the properties of a large business. Mr. James E. Allison, formerly a member of the St. Louis Public Service Commission, as well as its chief engineer, was the first to appreciate the significance of these general principles.[2]

At any given time in the history of a large business undertaking with extensive and varied properties, properly maintained, some of the items of plant and equipment will be new, or nearly new. And unless the business has been newly undertaken, other items of plant and equipment will have nearly served their term of profitable use. Still others will be found in each of the possible stages of wear intermediate between newness and final replacement. It follows that an efficiently maintained property of this sort which has been operated for a sufficient number of years will normally be about half " worn out " and that, if renewals continue to be promptly made when needed, the property will normally tend to remain in this same average physical condition. This conclusion is subject to a few very simple qualifications. (1) No single item of plant or equipment can be so large and expensive, relative to the other items, that its degree of newness disproportionately affects the average state of wear. (2) The various items of plant and equipment must have been acquired at different times or else (the more common case) must have differing periods of life, so that replacements are distributed with some evenness through successive years. (3) The business must be in a static condition. If it is growing in size there will be a relatively larger amount of new equipment; if it is declining, some of the equipment may not be replaced as it wears out, and the property as a whole will be in a sub-normal condition.

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[1] Including land, grading, track laying, stores and supplies, contingencies, and interest during construction.

[2] Should Public Service Properties be Depreciated to obtain Fair Value in Rate or Regulation Cases ? Report to St. Louis Public Service Commission, 1912. Reprinted as Appendix A of the Report on the United Railways Co., by the St. Louis Public Service Commission, 1912; and as Appendix D of report of same commission on the Southwestern Telegraph and Telephone Co., 1913. Cf. also Mr. Allison's paper on " Depreciation," Annals Amer. Acad. Pol. and Soc. Science, vol. liii, p. 198 (May, 1914).

This last condition — that the aggregate size of plant and equipment is supposed to be neither increasing nor decreasing — is one which rarely holds true under American conditions. Most American railroad and public service corporations are apt to increase their investment in fixed capital from time to time.[1] But this fact does not affect the significance of the conclusion that there is such a thing as a state of "normal average depreciation." One might, if one pleased, modify the assumption of a normal depreciation of 50 per cent so as to allow for the effects of any given rate of growth. But this is scarcely necessary, for all practical ends are served by considering the present and future depreciation and probable replacement of the body of assets which exists at a given time, and for this purpose the 50 per cent average is generally appropriate. The other conditions are not usually far out of line with the facts. Indeed, the customary endeavor of every properly conducted business to prevent too large a burden of maintenance or replacement expenses from falling within any one year works potently toward securing a normal average condition of depreciation.

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[1] This is one of the reasons why the depreciated value of railroad properties as found by various commissions is generally considerably more than 50 per cent of the undepreciated value. Other reasons (aside from a possible large margin of error in the work itself) are the inclusion of non-depreciating assets in the valuation, and the fact that the residual or scrap value of the discarded assets has to be taken into account. Thus a steel rail costing $28 per ton and with a scrap value of $12 per ton would when "half worn out" be valued at about 71 per cent of its cost new.

The result of this general analysis not only indicates the magnitude of the interests affected by the question of the proper treatment of depreciation in valuation for purposes of rate control, but, as will be indicated later, it has an important bearing upon the proper answer to that question.

Durable capital goods are said to "depreciate," while less durable ones are "used up" or "consumed." The difference is, of course, one of degree only. Buildings, rails, and locomotives are worn out slowly; fuel, oil, and other supplies are used up rapidly; but in the long run the two processes are alike. Just where the line shall be drawn between them for accounting purposes is determined by the fact that a year is the ordinary fiscal unit of time. Assets whose normal length of life is more than a year are "capital assets," and "depreciate"; assets of a more transient sort are used up and replaced within the year, and their cost is counted under the head of operating expenses. If the customary fiscal unit of time were five years, or twenty years, there would be fewer assets whose depreciation would have to be taken into account. Part of what are now capital assets would in a longer fiscal period appear as current assets. But, as it is, we wish to know the profit or loss of a business undertaking during a year, and its general condition at the end of the year. So some method must be devised of allocating the cost of the more durable instruments of production among the successive years of their period of life. "The more permanent form of assets serving for productive use during a period of years should be spread as an expense during the period of use, whether that be five or fifty years."[1]

It is not surprising that there is no general agreement among accountants respecting the proper basis of thus cutting up and parcelling out the total cost of a durable good. It is easy to concede that the purpose of accounting is to ascertain and exhibit the true condition of a business, but just what the truth is will depend upon the specific question which we ask the accountant. Do we want to know from the balance sheets whether the productive efficiency of the durable equipment of a business is being maintained unimpaired ? Is the most accurate statement possible of the profit or loss of a particular year the *desideratum* ? Are we looking toward the future and asking whether adequate provision is being made for the amortization of the cost of the durable capital assets that will have to be replaced ? Or do we have a possible insolvency in mind, and seek to know the market value of either the equipment as a whole or its different parts ? Emphasis upon one query would logically lead to apportioning depreciation among the various years of life of a durable good according to the diminution of its productive efficiency; the proper answer to others would be given by apportioning depreciation according to the requirements of annual contributions to a sinking fund or according to the diminution in the estimated market value of the assets in question. Very frequently actual accounting practice represents, necessarily, a compromise between two or more of these different possible methods of procedure. Thus we find, for example, that one of the points sometimes made in favor of the method of dividing the total depreciation of an asset into equal annual parts is that while the market value of many capital assets (machines, perhaps) declines most rapidly in the first few years of use, the technical efficiency of the same assets declines most rapidly in the years just before they are discarded.

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[1] H. R. Hatfield, Modern Accounting, p. 122. The following admirable statement is by Mr. J. S. Eaton (Handbook of Railroad Expenses, p. 3): " So we see that capital expenditure, as distinguished from expenses, is at last an arbitrary conception. It begins with the idea that certain expenditures have an efficiency that reaches over many earning periods extending indefinitely into the future. But nothing physical would last so long, and its earning power might have even less permanence. To meet this condition we arbitrarily designate certain expenditures whose effect indefinitely outlasts the immediate earning period as ' capital,' and then in the same arbitrary way, through all subsequent vicissitudes, we hold them to their first value, by maintenance, renewal and depreciation charges which are borne by current expenses."

These and similar considerations have to be weighed in any thoro analysis of the problem of the proper recognition of the fact of depreciation in private enterprises. They are also properly to be taken into account in discussing the business policies of unregulated public service industries. Altho the principle that the charges of such industries must be reasonable is of long standing, this cannot be said to have had any particular bearing upon the depreciation problem until some basis for the determination of " reasonableness " was laid down by commissions and courts.

But with regulated public service undertakings the case is different. Here the proper adjustment of depreciation accounts is not merely a matter of business policy nor of the proper adjustment of the interests of the holders of the various classes of equities in the earnings and assets of the business. It directly affects the issue between the proprietors of the undertaking on the one hand and the public on the other. It does this by operating on, first, the amount of annual net earnings shown by the accounts, and, second, the real or apparent magnitude of the capital investment. This bringing in of the public interest as a matter of primary concern helps to define and narrow the problem and at the same time raises new issues.

There is no better way of approaching the question of the proper treatment of depreciation in the valuation of the properties of public service companies than by examining in some detail the functions and results of depreciation accounts in public service undertakings. Railroads will serve as the best example, not only because of the magnitude of the interests involved, but also because the accounting rules of state public utility commissions have been patterned in large measure after those of the Interstate Commerce Commission. The principles involved are of general application.

The Interstate Commerce Commission, acting under the increased powers over the accounts of railroad companies given it by the Hepburn Act of 1906, now requires that the depreciation of rolling stock be counted as an operating expense.[1] The introduction of this account was in line with a general attempt to draw the line more accurately between "additions and betterments" on the one hand and the mere replacement or maintenance of existing capital on the other. Maintenance accounts, as every one knows, had been the loose ends of railroad book-keeping. In an earlier period of American railroad finance, inadequate appropriations for maintenance of way and equipment furnished a common method of milking the property and of manipulating the value of securities through the payment of unearned dividends. In more recent years this practice had become relatively less frequent, and many of the stronger roads had gone to the other extreme of overstating their maintenance costs by counting many sorts of additions and betterments as replacements. It was in part to control this practice that the regulations referred to were instituted by the Commission. In addition to these requirements, elaborate rules were later made for the definition and classification of additions and betterments.

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[1] Under the latest revision of the I. C. C. Classification of Operating Expenses, taking effect July 1, 1914, accounts are also provided for the depreciation of fixed improvements, including way and structures. But for the present the use of these accounts is optional with the carriers.

There was much complaint that these regulations interfered in an unwarranted way with the companies' rights to determine their own financial policies, and much was said about the advantages of the conservatism expressed in the understatement of net earnings. It was alleged, furthermore, that replacements and renewals fell so evenly in the case of a large railroad that it was unnecessary to provide for them in advance. The reply of the Statistician for the Commission was to the effect that the control of accounts is not the control of financial policies; that the railroads were still free to make such disposition of their earnings as they chose: that "capital assets are consumed in operation . . . regardless alike of the corporation's policy of management or the Commission's rules of accounting"; that these rules deprived the railroads merely of the opportunity to misstate the facts.[1]

There is no reason to doubt the wisdom of the general policy expressed in these orders of the Commission. Charging betterments to operating expenses builds up a "secret reserve" which can be brought to light at any time and thus made as effective a means of manipulation as unearned dividends. The arbitrary diminution of the amount available as net income, by reason of swollen maintenance expenses, may frequently be unfair to the owners of income bonds or of non-cumulative preferred stock, or to other holders of equities in the business who may be more interested in maintaining present returns than in increasing future profits. Finally (and what from the point of view of the present inquiry is most important) it is not to the public interest that the existing level of rates should appear to be less profitable to the railroads than it really is.[1]

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[1] Twentieth Annual Report on the Statistics of Railways (1907), pp. 21–24.

Some difficulties have developed, however, in the handling of the depreciation accounts. The Commission did not prescribe the annual rates of depreciation which the carriers should use for different classes of equipment. It now reports, "This latitude has resulted in widely different practices, the rates used by different carriers varying from nothing up to 7 per cent or more per annum upon equipment operated under substantially similar conditions. It seems evident that this variance is in some cases due to differences in policy rather than differences in actual depreciation or in the estimates thereof."[2] The result is, of course, that we still have many instances where the net income is either overstated or understated, according as the rate of depreciation used is too low or too high. This can be corrected in the future and undoubtedly will be. The chief obstacle to the efficient control of depreciation charges has been the paucity of reliable statistics of the average life of different sorts of equipment under different operating conditions.

A more serious difficulty has arisen in connection with the disposition of the "depreciation reserve" which is created by the depreciation charges. And here we have to do with a matter of fundamental importance. The depreciation charges were inaugurated by requiring the carriers to include in their operating expenses a monthly charge of one-twelfth of the estimated annual depreciation on each item of equipment. The determination of the various rates of depreciation to be assumed was, as we have seen, left to the carriers. An amount equal to the total charges for depreciation each month had to be credited to a " replacement " account. These replacement accounts were in turn charged with the cost of all new equipment acquired in place of equipment discarded or destroyed. Now it might happen, of course, that particular items of equipment would be worn out or destroyed before the accumulated depreciation charges on them would have amounted to enough to provide for their replacement. Even if the depreciation rates used had been found to accord with average experience there would have been a deficient provision for the replacement of all items of equipment which happened to be destroyed or abandoned before reaching the " average expectation of life."[1] Moreover, many items of equipment were already old on July 1, 1907 — the date at which depreciation charges began. So a " renewals " account for each class of equipment was also instituted. To the renewals account was charged as an operating expense the value of any item of equipment destroyed or otherwise retired from use minus salvage and the amount already accumulated in depreciation charges.

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[1] The Commission has recently stated: "There is manifested [by the carriers] a growing appreciation of the importance of exact and theoretically correct accounting. At the same time there is a corresponding decline in the opinion, once too prevalent, that accounting may properly be governed by the policy or by the financial situation or needs of the accounting carriers." — Twenty-seventh Annual Report (1913), p. 39. The accounting regulations of the Commission have recently been sustained by the Supreme Court, in Kansas City Southern Ry. Co. v. U. S., 23 U. S. 423 (1913).

[2] Twenty-seventh Annual Report (1913), p. 39.

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[1] Account should be taken of this official statement: " It is not intended that these accounts should be restricted to individual cars or locomotives. . . . On the other hand, the several amounts standing to the credit of these replacement accounts should be available to carriers for the purpose of replacement of equipment to the extent of such credits." — Classification of Operating Expenses, Third Revised Issue (1907), p. 92. Later in response to a specific inquiry, it was definitely stated that the reserve created by depreciation charges on one class of equipment might be used for the purchase or replacement of other classes of equipment. (I. C. C. Accounting Bulletin No. 1, 1908, Case 108.) But these rulings are clearly inconsistent with the principle of the renewals account, by which provision was made for an adequate replacement reserve for each individual item of equipment. The real effect of the rulings was to make it possible for railroads to use the surplus in their replacement accounts in what were virtually additions and betterments, thus keeping their " property account " intact. The ruling in Case 108, referred to above, was later cancelled (I. C. C. Accounting Bulletin No. 4, 1909).

Thus, if a freight car which had cost $500 had been destroyed with a salvage of $75, when only $125 had been charged to depreciation for this car, a charge of $300 would at once be made to "renewals." The renewals account may be interpreted as a device for recording for each particular item of equipment the amount of finally realized depreciation not previously covered in the depreciation account. Operating expenses were in this way annually charged with (1) an amount representing the depreciation attributed to the wear and tear of the year's use, and (2) a further amount representing the total amount of depreciation on equipment retired within the year not previously written down.[1]

It seems to have been assumed that the amount of credits in the replacement reserve from accrued depreciation together with the amount of charges to renewals would stop the practice of charging to maintenance the expense of real improvements in equipment. At least in much of the current discussion of the problem it was assumed that depreciation charges would in some way be a gauge of proper allowances for maintenance. And it is hard to find any other significance in the official statement that "all replacements in excess of such credits must be considered as Betterments or Additions, and charged either to Income or to Capital."[2]

Whatever may have been the expectation, it is quite impossible that the magnitude of the replacement reserves should in any way have really determined the amount of expenditures properly chargeable to maintenance rather than to additions and betterments. For at any given time these reserves, together with the charges to renewals, would afford ample provision for all equipment retired from use and just about to be replaced, and would also contain *an additional amount equal to the accumulated depreciation charges on all equipment remaining in service.* This additional amount or surplus could not be written off for replacement purposes except as the particular items of equipment on which depreciation had accumulated went out of service,[1] and in the meanwhile it would in the normal course of things have been further swollen by the continuing accruals of depreciation charges. Since this continually growing surplus could not be used for legitimate replacement purposes, it furnished an opportunity to the carriers to charge expenditures for additional equipment to replacement and, hence, to operating expenses. The term " replacement account " was a misnomer.

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[1] Subsequently the carriers were permitted to charge realized depreciation allocated to the period of use before July 1, 1907 to profit and loss instead of operating expenses. Cf. I. C. C. Accounting Bulletin No. 8 (1912), Case 574, and p. 654, infra.

[2] Classification of Operating Expenses, Third Revised Issue (1907), p. 12.

When a more rigorous control of these matters was determined upon, those in charge of the accounting policies of the Commission had two possible methods of procedure open to them. One was to so readjust their rules that depreciation charges would in fact furnish an adequate replacement fund and nothing more. This, as we shall see, was practicable, altho not advisable. The alternative was to admit that the existing replacement accounts were not replacement accounts at all and to call them something else. This was done.

The new rule was phrased, " The accounts heretofore referred to as ' Replacement' accounts should hereafter be kept under the name of ' Reserve for Accrued Depreciation.' "[2] The total amount of the balances in these accounts must now be shown on the balance sheet as a deduction from the aggregate investment in road and equipment. This is, in substance, a frank recognition of the permanent character of this reserve and of the fact that in the normal run of events it cannot be diminished, but, on the contrary, is bound to increase. The account, moreover, has a new meaning. It is no longer supposed to have any definite bearing upon current replacements; it is held to represent the amount by which the values in the (equipment) property account have been diminished by the lapse of time. The regulation of expenditures for additions and betterments is now accomplished in a simple and adequate fashion. It is required, as before, that when an item of equipment goes out of service only the difference between its cost or ledger value and the subsequent accumulation of depreciation charges on it shall be charged to operating expenses,[1] the remainder of the cost of replacement having already been charged to operating expenses through the depreciation account. But this is controlled by means of a new " equipment " account, the balance in which represents the difference between the aggregate expenditure for new equipment and the cost or ledger value of equipment retired. This balance is thus a measure of additions and betterments to equipment, provided that one measures replacements by the aggregate amount of realized depreciation (retirements) during the year. The equipment account, it will be noted, is quite disassociated from the accrued depreciation account, and in no way dependent upon depreciation charges of any sort.

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[1] Despite official rulings to the contrary. Cf. note on p. 640, supra.

[2] I. C. C. Classification of Expenditures for Additions and Betterments, first revised issue (1910), p. 19.

The reserve for accrued depreciation is, then, identical with the old replacements account except that its significance is more accurately interpreted and that it is more adequately protected against being depleted to cover virtual additions and betterments. But to some carriers the change (in interpretation) seemed to carry with it large consequences. One inquiry reads: "This is a radical departure from the methods adopted by the Commission, July 1, 1907 . . . and the question now arises as to what carriers are to do with the vast sums they have charged in the past for depreciation on equipment."[1] Another is: "A carrier has left standing in its Replacement account a large balance, which will be constantly augmented and it does not appear to be available for any purpose. How is this account to be closed?"[2] The accounting authorities of the Commission replied: "The effect of the methods prescribed for handling the accounts is that the account Property Investment will, in theory, include the actual cost of all equipment owned, while the depreciation account will represent the expired value or depreciation on the equipment."[3] This, of course, contemplates no closing of the account.

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[1] Specifically, to the " retirements " account, as the old " renewals " account has been more appropriately renamed. The reserve for accrued depreciation is, of course, debited with an amount equal to the sum previously credited to it on account of the particular equipment retired.

Let us turn from the present status of the Commission's regulations to the alternative procedure which it might have adopted when it was found that the replacement reserves were growing too rapidly to serve as a check on maintenance expenditures. If instead of changing the interpretation of the significance of the replacements account, it had desired so to modify the system of crediting to this account that it would have furnished a real gauge of proper maintenance charges, this could conceivably have been accomplished. Roughly approximate results could have been obtained, for example, by (1) charging depreciation as planned upon all existing equipment and upon all equipment subsequently acquired to replace it; (2) abolishing the renewals or retirements account; and (3) charging no depreciation (except perhaps to cover actual retirements) on any class of additional new equipment until the expiration of t years from the introduction of the new regulation (where t represents the " expectation of life " of the equipment in question). Beginning with the end of t years, depreciation would have to be charged on all the additions made up to that time to that particular class of equipment, and would continue to be charged upon all equipment bought to replace these additions. But in each successive period of t years no depreciation would be charged upon yet further additions to equipment of the same class.[1]

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[1] I. C. C. Accounting Bulletin No. 8, Case 567.

[2] Case 575.

[3] Case 567.

To make the matter clear take the artificially simple case of a railroad owning n locomotives, each of which has cost $10,000 more than its scrap value and has a total period of serviceable life of ten years. Assume further that these locomotives have been acquired in fairly even numbers in successive years to replace discarded equipment. Then of the n locomotives in service at the beginning of the fiscal year about one-tenth will be discarded within the year. The normal depreciation charge per locomotive per year is $1000. So that if depreciation charges are inaugurated at the beginning of the year, the accruals for the year ($n \times \$1000$) will just suffice to replace the $\frac{n}{10}$ locomotives which will be discarded during the year. And in each succeeding year depreciation charges and replacement costs will continue to equal each other.

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[1] This rough method is based upon the premise that annual depreciation charges upon equipment, fairly evenly distributed with respect to age between newness and readiness for retirement, will suffice to provide for annual replacements. It would apply only to large railroads and would have to be modified if the railroad possessed more new equipment than old (or *vice versa*) or if additions made in each successive period of t years were not distributed with some evenness among the individual years. Given the age statistics of the equipment of any railroad, it would be easy to prescribe formulas for depreciation charges that would adequately provide for replacements and no more. But the purpose of the rough illustration given in the text is to distinguish " depreciation for replacement " from the so-called depreciation that is measured by the expired proportion of the aggregate probable years of life of the equipment on hand.

Up to the time when depreciation charges were begun the n locomotives then in service had completed in the aggregate $5n$ locomotive years. If the depreciation charges were to conform to the Interstate Commerce Commission's accounting rules it would have been necessary not only to make the provisions just described, but also to reach back into the past and set down depreciation charges on each locomotive retired for each of its years of life prior to the inauguration of the accounting system. And it would be necessary to proceed in this way until all of the original n locomotives had been replaced. Since the regular annual depreciation charges are adequate to provide for all replacements, the net result of the additional (retirements) charges would be the accumulation of a permanent and unusable reserve for accrued depreciation amounting to $5n \times \$1000$, or just half the difference between the original cost of the n locomotives and their scrap value.

In this simplified case current annual depreciation charges, without further additions on account of retirements, are a proper measure of current annual maintenance expenditures. And, given sufficient data, there is no difficulty of principle in thus equating depreciation and maintenance in the case of an actual railroad, with its equipment unevenly distributed in point of age. But the Interstate Commerce Commission's present method of controlling replacement costs is simpler and better. The outcome of the equipment account is that the amount of annual expenditures for new equipment charged to operating expenses is determined by the (cost) value of the equipment retired within the year. Realized depreciation, rather than so-called partial depreciation (measured by the proportion of the aggregate probable life of the equipment on hand which has expired within the year) is the controlling factor.

In the case of a large railroad with varied equipment this completed depreciation (retirement) will be sufficiently uniform in amount, year after year, to obviate undue fluctuations in annual replacements. And from the point of view of logic this method has the distinct advantages (1) that realized depreciation is a definitely measurable fact and (2) that replacements happen in fact to be made on account of realized depreciation and for no other reason.

By adequately providing for the control of expenditures for replacements this practice weakens the case for requiring depreciation accounts.[1] When these accounts were instituted the railroads had claimed that their properties were so large and varied, and their maintenance expenditures consequently so regular, that maintenance itself was a sufficient protection against all depreciation. The rejoinder was, as we have seen, that in practice maintenance charges were frequently either too small to provide for replacements or were made unduly large through the inclusion of provision for additions and betterments. But with maintenance controlled, depreciation charges become, in effect, merely a way of measuring a presumed consumption of capital over and above the amount annually replaced.

Moreover, it would now be idle to claim that to require depreciation charges is in no manner to interfere with the financial policy of the railroads. For the compulsory annual additions to the reserve for accrued depreciation decrease by their full amount the apparent profits of the year and thus the amount available for dividends. Altho no investment of a separate depreciation fund is required, yet the writing down of the capital assets by the amount of the accrued " depreciation " means in the long run either that other assets have to be larger in amount than they otherwise would have been or that liabilities have to be smaller. Usually the growth of the reserve for accrued depreciation means in practice that additional permanent investments are being made out of earnings. The reserve represents an additional, permanent, and compulsory investment in the business to take the place of the amount of the investment written off for depreciation. To require such a reserve to be created is to control, in that degree, the financial policies of the companies affected. This is not to condemn the requirement in question, but merely to show its real significance.

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[1] With the depreciation accounts eliminated, the entire cost of discarded equipment, minus salvage, would be charged to operating expenses under the rubric of "retirements."

But, it may be objected, surely property that is half worn out is not worth as much as when it was new. Should not its value be written down, if the balance sheets are to tell the truth ? This question has significance only if it be assumed that the purpose of the depreciation accounts of railroads and other public service companies is to record the *decline in the market value of individual assets.* But even for private business undertakings this is not, in the opinion of the majority of competent writers, the purpose of depreciation accounts. It is most certainly not their purpose in railroad and public utility accounting.

The balance sheets of public service corporations are not designed, as those of a merchant might be, with primary reference to a possible insolvency. The outlook to be assumed is that of continuous and permanent operation. Many of the parts of a public service property could not be detached and sold except as scrap. And as for the market value of the undertaking as a whole, it is scarcely necessary to say that this is a matter of earning power, which depends upon rates and hence eventually upon the manner in which public control is exercised. It is hardly to be expected that any one will defend the propriety of a reserve against the possible depreciation of market values resulting from compulsory rate reductions.

Nor are the depreciation charges on public service properties supposed in any way to represent a diminution of the productive efficiency of the plant and equipment. For with replacements and repairs properly attended to, there is no general decline in productive efficiency. Even for any individual item among the wasting assets the loss of productive efficiency usually comes as a sharp decline near the end of its period of life rather than a gradual deterioration spread evenly through its years of use.

The depreciation to be reckoned with in the case of such properties is merely a phase of cost-keeping — a device for allocating the consumption of capital among the successive years. The concrete facts to be recorded as best they may are not the "using up of values" (whatever that may mean) nor yet anything related to a deterioration in the service rendered, but merely the actual expiration of part of the aggregate probable period of use of the instruments of production on hand, and the nearer approach of the time when they will have to be replaced.

Profits and interest, it is very certain, cannot be counted until the principal of an investment is replaced or provision is made for its replacement. In the case of a business where one item forms the bulk of the income-yielding assets — a steamship, a coal mine, a patent right purchased at a price, for example — either enough must be set aside out of annual earnings to replace the original cost of the property when it is abandoned or retired, or the proprietors must be content to consider that their investment is being returned to them in instalments. If the business is to be continued on the same scale the replacement must, of course, be provided for in advance or else the proprietors must make a second investment equal in amount[1] to the first.

All this is elementary. It is brought into the present discussion merely to indicate clearly the conditions under which a reserve for accrued depreciation is well-nigh indispensable. But where a property is varied and no single wasting asset or group of such assets is of dominating importance the case has been shown to be different. The periods of use of the different items of assets *overlap*, so that when depreciation is charged from the beginning on each item, a reserve begins to accrue on a given item before the reserves accumulated on account of other items have been diminished on account of replacements. The permanent reserve thus created is not needed. Nothing corresponding to it appears in the simpler case where depreciation is registered on some large asset representing the major part of the investment. It is very likely that some of its defenders fail to distinguish between depreciation charges to provide for replacement and depreciation to provide for liquidation — *i. e.* to maintain market value.

The fallacy in the view that the " reserve for accrued depreciation " is a necessary record of fact hinges on what is from the economic point of view the more or less accidental circumstance that the productive equipment of an undertaking happens to be in units of a sort that *are defined as units by the customary categories of purchase*

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[1] Disregarding possible changes in the prices of capital goods.

and sale. In economic fact the property of a public service undertaking as a whole is a productive unit. Consider it as such, — then replacements appear merely as repairs necessary to keep the whole property in a state of efficiency. Repairs in this large sense are of course to be counted as operating expenses, as is true of minor repairs. But if such repairs are fairly regular in amount year by year there appears to be no inexorable reason why a fund to provide for them should be accumulated in advance and more especially a fund that will amount to much more than the actual annual cost of the repairs.

But another and apparently more weighty objection may be brought against this denial of the inevitableness of the depreciation reserve. If no such reserve is provided while the property changes from a condition of newness to a condition where it has on the average about half its original expectation of life, does this not mean (if the business has been profitable) that about half the original investment has been returned to the pockets of the stockholders ? And should not the amount of the investment as it appears in the balance sheet be written down accordingly ? This point is apt to be especially stressed by the defenders of the depreciation reserve.

But these questions cannot be answered categorically. There is no necessary correlation between the mere aging or even the physicial wear and tear of capital goods and the diminution of the investment. The concrete facts in the case are few. When capital goods are installed their cost is a definite amount of investment; when they are retired from use the investment is diminished by the amount of their cost, minus salvage. If such capital goods are replaced promptly when retired, is not the amount of the investment, in every real sense, kept intact ?

The only assumption on which any other answer seems admissible is that in addition to repairs, replacements, and other costs, contributions to a reserve for accrued depreciation are *contemplated in advance as part of the expected costs of operation* and consequently taken into account in determining the nature and amount of the original investment. If the investment is made with this expectation, the failure to maintain such a reserve may very properly be said to diminish it.

It can hardly be seriously urged that before the days of regulation by commissions a public service company ought to have decided to build up a useless depreciation reserve. Against such a supposition we have the known facts (1) that such was not the general practice at the time, and (2) that the trend of court decisions was to the effect that depreciation, even against replacement, need not be counted as part of operating costs.[1]

In the absence of such a reserve net profits for the time being [2] would of course have been higher than if a reserve had been accumulated. But to claim that this difference in the amount of profits represents the return to the proprietors of part of the principal of their investment is to beg the whole question. Such terms as " diminution of investment " and " repayment of principal " are clearly defined only in the case of a contractual loan. In the case of a permanent industrial investment for profit there is no such definition at hand. Lacking it, we can only turn to the expectations, plans, and estimates of the proprietors in order to determine what may properly be called net income.

To make the point clear we may take a marginal case. Suppose that an investment of $10,000,000 is made with the expectation of maintaining the property intact by all necessary replacements, but with no idea of accumulating a depreciation reserve. Suppose further that if contributions to such a reserve had, of necessity, entered into the calculations, the investment would not have been made, or, at any rate, would have been smaller. Can it be argued that the failure to maintain such a reserve is equivalent to repocketing part of the original investment ?

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[1] See H. R. Hatfield, Modern Accounting, pp. 124, 125, and cases there cited.

[2] Until the properties had reached that static condition where replacements normally balance annual depreciation, — and similarly for additions to the properties.

In general, there is a reasonable presumption that the investments in undertakings which have not accumulated a depreciation reserve were not made with the expectation that it would be necessary to charge depreciation accruals to operating expenses. It follows that it cannot in general be presumed that the profits of such undertakings have contained an element which should unquestionably be considered a repayment of part of the invested principal. Accordingly, serious objection might properly be made to a system of compulsory accounts which requires that property already on hand be written down for depreciation.

The control of accounting with respect to property acquired after the new system of accounts is introduced is quite another matter. These subsequent investments (including replacements) are made with full knowledge of the accounting rules in force and of the way in which " profits " are to be defined and measured. Whether a " reserve for accrued depreciation " should be required for such property is purely a matter of public policy. They are not necessary to the continued and successful operation of the property. But there are several points in their favor. Such inequalities as occur in the replacement needs of successive years can be met with less shock. Annual profits tend to remain steadier when variations in replacements are largely absorbed by the variation of corresponding charges to the depreciation account rather than being directly charged to current operating expenses. And in the case of possible purchase at some future time by the government the existence of adequate reserves against all accrued depreciation would greatly simplify the problem of valuation for sale, just as it would eliminate some of the difficulties that now attend the problem of valuation of rate control.

From the point of view of public policy, then, the depreciation rules of the Interstate Commerce Commission and of the various state commissions which have followed its lead are in general reasonable and apparently well-advised. They seem open to criticism only in so far as they compel the accumulation of depreciation charges on property acquired before the rules were put into operation. Under the Interstate Commerce Commission's regulations such charges are handled differently according as the depreciation is allocated to the period before or after July 1, 1907. Depreciation accruing subsequent to that date on property then in existence is, of course, charged to operating expenses. But this amount of depreciation is, as we have seen, roughly offset by replacements. It is only the depreciation charged on new additional equipment during its first years of use and on old equipment before the inauguration of the accounting system that accumulates as a permanent reserve.[1] It is only the practice of reaching back into the past for whatever depreciation is supposed to have accrued before July 1, 1907, that is open to objection.

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[1] This is of course an arbitrary division of the depreciation charges. In fact all depreciation accruals over and above the amount of " realized depreciation " during a year accumulate as a reserve. The " realized depreciation " is in part on equipment installed before July 1, 1907. But there is, nevertheless, a rough equality between the depreciation realized in a year and the total amount of depreciation on equipment on hand credited to reserve during the year.

But even in this respect the case is less serious than might be supposed. During the first two years of the new accounting régime, it is true, all of the realized depreciation (cost minus salvage) on equipment retired seems to have been charged directly to operating expenses. But under the present rules that part of realized depreciation which is allocated to the period before July 1, 1907, is charged directly to profit and loss, and the companies have the option of charging such depreciation in the same manner before the equipment is retired. The effect of thus debiting these retroactive depreciation charges to profit and loss rather than to operating expenses is to write down the investment shown in the property account without providing for an equivalent increase in other assets. Instead the amount is deducted from the accumulated surplus (or added to the accumulated deficit) of the company. This does not affect annual earnings and it will not often affect dividends. This method of disposing of retroactive depreciation charges tends to bring the whole property account, so far as it represents wasting assets, into line with the new requirements.

But it will be many years at best before the property accounts of most American railroads will have much significance, apart from that attached to their annual fluctuations. For railroads, as for lesser public utilities, the sum of permanent investments on which earnings are to be permitted can rarely be ascertained from the printed balance sheet. This being the case, there is no reason why either the Commission or the courts should consider these new accounting devices as throwing any light on the amount of the investment up to July 1, 1907. The retroactive part of the depreciation charges should have no bearing upon the valuation of railroad properties. In the long run there will be no substantial injustice to the railroads so long as the depreciation accounts remain merely a device for helping to determine what portion of gross earnings shall be available for distribution as net earnings.

This brings us back to our main problem. The significance of our lengthy digression into the matter of accounting regulations should now be apparent. To diminish the valuation of a railroad or other public service property on account of depreciation is to assume that depreciation should have been charged on each item of plant and equipment from its first installation. If the accounts of the company had been subject to regulation from the beginning, and if the accounting regulations had provided for depreciation charges, no exception could be taken to the recognition of depreciation as an element to be taken into account in valuation. But in such a case valuation would be unnecessary. The accounts would tell the story. Lacking such accounts we turn, perforce, to the value (there is no better word) of the tangible properties as affording about the only available evidence of the amount of investment entitled to a return. If the company has not set apart some of its annual earnings on account of depreciation, shall we assume that it should have done so, and scale down the value of the property accordingly?

With the exception of the St. Louis Public Service Commission all of the commissions that have squarely faced this question have answered in the affirmative. So has the United States Supreme Court. But the St. Louis Commission, in the cases previously cited,[1] has held that if replacements and renewals have been properly attended to, no deduction for depreciation should be made. To assume that a company should have provided for a depreciation reserve over and above its provision for replacements is, in effect, to assume that the absence of such a provision means that some of the investment has been returned to the stockholders along with their ordinary profits. To inquire into this last matter, says the St. Louis Commission, is virtually to regulate past profits — and that task it refuses to attempt.

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[1] Supra, p. 632, note.

This conclusion of the St. Louis Commission is, of course, in line with the general results of our analysis of depreciation charges. The case for the position of the St. Louis Commission seems to be stronger, however, if we put aside the difficult questions suggested by the reference to the possible regulation of past profits, and again recall (1) that "income" and "repayment of principal" are not, in fact, easily separable, and (2) that the expectations of the investors as to the expense of maintaining the invested capital intact may properly be taken as a criterion, provided that the plans thus made and followed are adequate to maintain the productive efficiency of the plant and equipment and are in harmony with both prevailing business practice and current legal decisions.

But the contrary view is the usual one. The opinions of the Wisconsin Railroad Commission may be taken as representative, since that body was a pioneer in this field and its precedents have been largely followed by other commissions. In one of its leading cases it has held as follows:

> Depreciation may be described as the amount that must be regularly set aside to cover wear and tear, etc., in order to keep the original investment intact. It is an operating expense and should be borne by the customers through the rates paid by them for the services rendered by the utility. But when depreciation is so borne by them, it should be set aside until needed for the renewal of worn out or useless parts of the plants. If under these conditions it is not so set

> aside and used, but diverted to the stockholders for their use or personal benefit, this diversion is tantamount to the payment of dividends out of the capital. It simply means that the money contributed by the consumers for the upkeep of the plant and the investment has been paid over to the stockholders instead of being devoted to the purposes for which it was properly intended. It can mean nothing else. Since depreciation, in a sense, is intended to keep the investment intact, it necessarily follows that by turning it over to the stockholders, a part of their capital is in reality returned to them, and that this, in turn, is reducing their investment in the plant. Since their investment is thus reduced, it would also seem that there should be corresponding reductions in the amount upon which the rates paid by the consumers are based. There would certainly seem to be instances where no other course would be equitable all around, unless the capital that has thus been withdrawn by the stockholders is restored to the depreciation fund. Investors no more than any one else can both eat their cake and have it. Equal justice between investors and customers requires that under normal conditions the rates paid by the latter should be high enough to meet all reasonable costs and to keep the investment intact. Under such conditions justice also requires that the amounts thus paid by the customers should be devoted to the purposes for which they were properly intended. Deviations from this should not, as a rule, become a charge against the consumers. If the stockholders, instead of keeping up the plant, have appropriated for their own use the money contributed by the consumers for this purpose, the amount so appropriated should either be returned to the depreciation fund or deducted from the valuation upon which the rates are based.[1]

This argument begs the question. It assumes that unless a useless depreciation reserve is accumulated, money contributed by consumers has been put into the pockets of stockholders as a virtual repayment of some of the capital originally invested. We have seen that such an assumption is unwarranted. Further examination of the opinion of the Wisconsin Commission in the same case shows that that Commission was confusing depreciation for replacements with physical depreciation as measured by the lapse of time. The opinion states that " as depreciation is constantly going on, the charges by which it is covered should also be regular. That is, a sufficient amount of money should be set aside each year to cover the cost of replacing each part of the plant as it becomes useless or unfit for further use." Evidently the Wisconsin Commission regards depreciation sufficient to cover replacement as entirely adequate. It fails to see that if a public service property has been properly maintained, all depreciation necessary to replacements is automatically absorbed by replacements and renewals themselves, and that the further accumulation of a depreciation reserve, useless for replacement purposes, is a burden which it is neither necessary nor just to assume should have been self-imposed by the companies.

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[1] Hill v. Antigo Water Co., 3 W. R. C. R. 641.

Further inconsistencies are found in other opinions of the Wisconsin Commission. Thus we find in the case of State Journal Printing Co. *v.* Madison Gas and Electric Co.:[1] "In the long run the total renewals should amount to the total depreciation, but for any given period there may be wide differences between them. During the earlier years of the life of the plant the depreciation is likely to be the greater. During some at least of the subsequent years the renewals are apt to be the greater." Not only this definite statement, but the general run of the opinion in the case, indicate that the Wisconsin Commission seems to think that a depreciation reserve is something which will sooner or later in the normal course of events be needed for replacements or renewals. We have seen that such is not the case. The Wisconsin Commission's decisions on this matter can be given little weight, for they are based upon an erroneous conception of the facts. In a more recent case[2] the same Commission says, "the depreciation reserve should ordinarily be sufficient to provide for wear and tear, obsolescence, and inadequacy," but in their actual valuation work the Commission insists that the depreciation reserve shall in effect be much larger than this — larger in fact by practically the whole amount of the sum deducted from the valuation on account of " depreciation."

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[1] 4 W. R. C. R. 560.

[2] King v. Wisconsin Telephone Co., 10 W. R. C. R. 521.

In the decisions of the Supreme Court we find precisely the same inconsistencies.[1] In its first definite pronouncement on this point [2] the Court held: " The cost of reproduction new is one way of ascertaining the present value of a plant like a water company, but that test would lead to obviously incorrect results, if the cost of reproduction is not diminished by the depreciation which has come from age and use." But it is important to know the reasoning on which this conclusion rested. This is given in another part of the opinion:

> A water plant, with all its additions, begins to depreciate in value from the moment of its use. Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs but for making good the depreciation and replacing the parts of the property when they come to

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[1] Quite apart from the matter of the accuracy of the Court's interpretation of the facts there is room to surmise that its decisions have been given undue weight by state commissions. The general attitude toward such matters taken by the Court — burdened with the duty of regarding rates established by legislatures or commissions as *prima facie* reasonable and just — is very different from that which would naturally be taken by a commission, charged with the duty of doing even-handed justice as between public utility companies on the one hand and the consumers of their products or services on the other. The Supreme Court has decided merely that prescribed rates which may not perhaps give a fair rate of return upon values measured by cost of reproduction new, without allowance for depreciation, are not on that account so surely and definitely confiscatory that they must be declared unconstitutional. A bald declaration like " when the estimate of value is made on the cost of reproduction new, the extent of existing depreciation should be shown and deducted " (230 U. S. 457) should not be isolated from its proper context nor interpreted without due regard to the necessary difference between the factors which control the decision of the Supreme Court of the United States in passing upon the constitutionality of state legislation and those other factors which should control the decision of a public utility commission in determining a reasonable level of rates.

[2] Knoxville v. Knoxville Water Co., 212 U. S. 7 (1909).

> the end of their life. The company is not bound to see its property gradually waste, without making provision out of earnings for its replacement. It is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision, but it is its duty to its bond and stockholders, and, in the case of a public service corporation at least, its plain duty to the public. If a different course were pursued the only method of providing for replacement of property which has ceased to be useful would be the investment of new capital and the issue of new bonds or stocks. This course would lead to a constantly increasing variance between present value and bond and stock capitalization — a tendency which would inevitably lead to disaster either to the stockholders or to the public, or both. If, however, a company fails to perform this plain duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over-issues of securities or of omissions to exact proper prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question the true value then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors in management which have been committed in the past.

So far as this means that a company should not be allowed to add the cost of replacements to its capital account, it would command general assent. But so far as it means that a " reserve for accrued depreciation " should have been maintained or (what comes to the same thing) that public service property should be " depreciated " in a valuation, it defeats its own purposes. The gist of the argument is that depreciation should have been counted from the beginning *in order to provide for replacements.* But we have seen that as a rule a reserve for accrued depreciation cannot be absorbed by replacements. To deduct from gross valuation on account of depreciation is to assume implicitly that depreciation charges should have been *more than adequate* to cover replacement, the surplus being measured (in general) by about the whole amount of the deduction. The Supreme Court has fallen into the same *error of fact* which entrapped the Wisconsin Commission. The deduction for depreciation cannot be justified by appealing to the necessity of providing for replacements.[1]

The present paper has been concerned only with the fundamental principles of depreciation as related to the problems of valuation for purposes of rate control. For simplicity's sake the only sort of depreciation that has been considered is that common and universal sort which is measured by the approach of the time when, in the normal course of events, replacements will have to be made. And the public service properties which we have had in mind are sufficiently large and varied to give the necessary validity to the assumption that depreciation accruals and replacements come in fairly regular amounts in successive years.

There are many cases which these general assumptions do not fit and for which our conclusions have to be correspondingly modified. In a small railroad the cost of a certain bridge may be a disproportionately large item, and it may be impossible to replace it from earnings except by the gradual accumulation of a depreciation reserve. In the valuation of such a railroad an allowance should be made for the depreciation of the bridge. So with small public utilities for which the power plant or some other wasting asset may be of dominating importance. But the principle of such exceptions is simple.

Nothing has been said about " depreciation for obsolescence." Obsolescence is unlike depreciation by reason of age because it cannot be foretold in advance —

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[1] In The Minnesota Rate Cases (230 U. S. 352), decided in 1913, the Court again ruled that allowance for depreciation should be made in a valuation based on cost of reproduction. In support of the ruling it merely cited the opinion in the Knoxville case.

even as an average for a group of items. Obsolescence, then, is a matter of fact, not of formula. Any reserve established to cover losses on account of obsolescence is really a special contingency reserve, — more closely analogous to an insurance fund than to an ordinary depreciation reserve. Whether allowance should be made for obsolescence in valuation procedure is quite a different question from that which we have been considering and its answer involves considerations that lie outside the scope of the present paper.[1]

Summarized, our conclusions then are:

1. If depreciation charges have not been required by public authority, it cannot be assumed that the proprietors of a large public service undertaking should have accumulated a reserve for accrued depreciation.
2. The absence of such a reserve does not necessarily mean that part of the principal of the investment has been returned to the proprietors.
3. In valuation for purposes of rate control no deduction should be made on account of the depreciation of large and varied properties, except for depreciation allocated to a period in which depreciation accruals were regularly charged to operating expenses.

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[1] The relative merits of different methods of apportioning depreciation among the years of life of an item of equipment have also been passed over. For convenience it has been assumed that depreciation charges, if imposed at all, are to be apportioned by the "straight-line method" (equal annual increments). But the argument is quite independent of this assumption.